AMENDMENTS TO THE CLAIMS

1. (CURRENTLY AMENDED) A color solid-state image pickup device including a plurality of photoelectric conversion areas provided in an array pattern on a surface of a semiconductor substrate, and a light-shielding film,

wherein the inside of each of said photoelectric conversion areas is two-dimensionally partitioned into a plurality of segments which output a plurality of photoelectric conversion signals of different spectral sensitivities using transfer electrodes,

wherein an aperture in said light-shielding film corresponds to at least two of said segments in one of said photoelectric conversion areas, and

wherein the diameter or diagonal dimension of said aperture is smaller than the diameter or diagonal dimension of said one photoelectric conversion area, and is larger than a dimension of at least one segment, ~~and~~

wherein said plurality of different spectral sensitivities include red, green and blue of primary colors, and the diameter or the diagonal dimension of each said aperture satisfies the formula $\lambda \leq t \leq 2\lambda$ wherein t represents the diameter or the diagonal dimension of said aperture and λ represents the wavelength 0.650 μm of a red color, and

wherein a distance between two of said transfer electrodes is smaller than a distance across segments adjacent to said two transfer electrodes,

the image pickup device further comprising an element isolation zone arranged between the segments in one photoelectric conversion area, wherein the transfer electrodes are formed so as to avoid said element isolation zone and to exist between said photoelectric conversion areas.

2. (CURRENTLY AMENDED) A color solid-state image pickup device including a plurality of photoelectric conversion areas provided in an array pattern on a surface of a semiconductor substrate, wherein

an inside of each of said photoelectric conversion areas is two-dimensionally partitioned into a plurality of segments which store signal electric charges of different spectral sensitivities,

a light-shielding film wherein an aperture in said light-shielding film corresponds to at least two of said segments in one of said photoelectric conversion areas, wherein said different spectral sensitivities include red, green and blue of primary colors, and the diameter or the diagonal dimension of said aperture satisfies the formula $\lambda \leq t \leq 2\lambda$ wherein t represents the diameter or the diagonal dimension of said aperture and λ represents the wavelength 0.650 μm of a red color, and

transfer channels, for transferring said signal electric charges read from a plurality of said segments, are formed beside said photoelectric conversion areas, said transfer channels extending along perimeters of said photoelectric conversion areas that are partitioned into said plurality of segments which store said signal electric charges of different spectral sensitivities, said transfer channels extending substantially parallel to said perimeters,

the image pickup device further comprising an element isolation zone arranged between the segments in one photoelectric conversion area, wherein the transfer channels are formed so as to avoid said element isolation zone and to exist between said photoelectric conversion areas.

3. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 1, wherein the surface of said semiconductor substrate is covered with said light-shielding film having apertures corresponding to said respective photoelectric conversion areas.

4. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 3, wherein the diameter or diagonal dimension of said aperture is larger than the wavelength of incident light.

5. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 1, wherein the spectral sensitivity of at least one segment is determined by a color filter provided at a position above said segment.

6. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 1, wherein the spectral sensitivity of at least one segment of said photoelectric conversion area is determined by the distribution of impurities in a depthwise direction of said segment.

7. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 1, wherein the spectral sensitivity of at least one segment is determined by a color filter provided at a position above said segment as well as by the distribution of impurities in a depthwise direction of said segment.

8. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 6, wherein said segment has a p-well layer provided in an n-type semiconductor substrate, and an n-type impurity layer formed in said p-well layer, and the spectral sensitivity of said segment is determined by selecting the depth of the p-well layer and the depth of the n-type impurity layer.

9. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 8, wherein a p-well layer of said segment having blue spectral sensitivity, a p-well layer of said segment having green spectral sensitivity, and a p-well layer of said segment having red spectral sensitivity are formed so as to become progressively deeper, in this sequence.

10. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 8, wherein an n-type impurity layer provided in said p-well layer of said segment having blue spectral sensitivity, an n-type impurity layer provided in said p-well layer of said segment having green spectral sensitivity, and an n-type impurity layer provided in said p-well layer of said segment having red spectral sensitivity are formed so as to become progressively deeper, in this sequence.

11. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 1, wherein each of said photoelectric conversion areas is two-dimensionally partitioned into at least three segments, that is, a segment having red spectral sensitivity, a segment having green spectral sensitivity, and a segment having blue spectral sensitivity.

12. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 1, wherein each of said photoelectric conversion areas is two-dimensionally partitioned into at least four segments, that is, a segment having yellow spectral sensitivity, a segment having cyan spectral sensitivity, a segment having magenta spectral sensitivity, and a segment having green spectral sensitivity.

13. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claims 11, wherein each of said photoelectric conversion areas is two-dimensionally partitioned into at least four segments, that is, a segment having red spectral sensitivity, a segment having green spectral sensitivity, a segment having blue spectral sensitivity, and a segment having spectral sensitivity whose peak appears in the vicinity of a wavelength of 520 nm.

14. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 13, wherein processing is performed by means of a signal read from said segment having spectral sensitivity whose peak appears in the vicinity of a wavelength of 520 nm, thereby performing color reproduction analogous to a color matching function.

15. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 1, wherein arrangement of segments having the same spectral sensitivity differs from one photoelectric conversion area to an adjacent photoelectric conversion area.

16. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 1, wherein at least one of said segments in said photoelectric conversion areas differs in area from the other segments.

17. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 16, wherein areas of said segments in the photoelectric conversion areas are inversely proportional to the magnitude of relative spectral sensitivity per unit area of each segment.

18. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 1, wherein said color solid-state image pickup device is used for a digital camera.

19. (CURRENTLY AMENDED) A MOS image sensor having a plurality of photoelectric conversion areas provided in an array pattern on a surface of a semiconductor substrate, wherein

an inside of each of said photoelectric conversion areas is two-dimensionally partitioned into a plurality of segments which output photoelectric conversion signals having a plurality of different spectral sensitivities,

a light-shielding film wherein an aperture in said light-shielding film corresponds to at least two of said segments in one of said photoelectric conversion areas, wherein said plurality of different spectral sensitivities include red, green and blue of primary colors, and the diameter or the diagonal dimension of each said aperture satisfies the formula $\lambda \leq t \leq 2\lambda$ wherein t represents the diameter or the diagonal dimension of said aperture and λ represents the wavelength 0.650 μm of a red color,

peripheral circuits connected to said segments are arranged around said photoelectric conversion areas, along perimeters of said photoelectric conversion areas, and

transfer channels, for transferring signal electric charges read from a plurality of said segments, are formed beside said photoelectric conversion areas, said transfer channels

extending along perimeters of said photoelectric conversion areas and substantially parallel to said perimeters,

the image sensor further comprising an element isolation zone arranged between the segments in one photoelectric conversion area, wherein the transfer channels are formed so as to avoid said element isolation zone and to exist between said photoelectric conversion areas.

20. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein the surface of said semiconductor substrate is covered with a light-shielding film having apertures assigned to said respective photoelectric conversion areas.

21. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 20, wherein the diameter or diagonal dimension of said aperture is larger than the wavelength of incident light and smaller than the diameter or diagonal dimension of said photoelectric conversion area.

22. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 20, wherein one microlens is provided so as to correspond to one aperture.

23. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein photoelectric conversion signals are sequentially read from respective segments into which said photoelectric conversion area is two-dimensionally partitioned.

24. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 23, wherein the photoelectric conversion signals read from said respective segments are output to a common signal line.

25. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein the spectral sensitivity of at least one segment is determined by a color filter provided above said segment.

26. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein the spectral sensitivity of at least one segment of said photoelectric conversion areas is determined by the distribution of impurities in a depthwise direction of said segment.

27. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein the spectral sensitivity of at least one segment is determined by a color filter disposed above said segment and the distribution of impurities in a depthwise direction of said segment.

28. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 26, wherein said segment has a p-well layer provided on an n-type semiconductor substrate, and an n-type impurity layer formed on said p-well layer, and the spectral sensitivity of said segment is determined by selecting the depth of said p-well layer and the depth of said n-type impurity layer.

29. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 28, wherein the depth of an n-type impurity layer of said segment having blue spectral sensitivity, the depth of an n-type impurity layer of said segment having green spectral sensitivity, and the depth of an n-type impurity layer of said segment having red spectral sensitivity are made progressively deeper, in this sequence.

30. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 28, wherein the depth of a p-well layer of said segment having blue spectral sensitivity, the depth of a p-well layer of said segment having green spectral sensitivity, and the depth of a p-well layer of said segment having red spectral sensitivity are made progressively deeper, in this sequence.

31. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein said individual photoelectric conversion area is two-dimensionally partitioned into at

least three segments; i.e., a segment having red spectral sensitivity, a segment having green spectral sensitivity, and a segment having blue spectral sensitivity.

32. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein said individual photoelectric conversion area is two-dimensionally partitioned into at least four segments; i.e., a segment having yellow spectral sensitivity, a segment having cyan spectral sensitivity, a segment having magenta spectral sensitivity, and a segment having green spectral sensitivity.

33. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein said individual photoelectric conversion area is two-dimensionally partitioned into at least four segments; i.e., a segment having red spectral sensitivity, a segment having green spectral sensitivity, a segment having blue spectral sensitivity, and a segment having spectral sensitivity whose peak appears in the vicinity of a wavelength of 520 nm.

34. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 33, wherein processing is performed by use of a signal read from said segment having spectral sensitivity whose peak appears in the vicinity of a wavelength of 520 nm, to thus perform color representation analogous to a color matching function.

35. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, further comprising segments which have equivalent spectral sensitivity and are arranged in a different pattern, at a position between said adjacent photoelectric conversion areas.

36. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein the area of at least one segment of said segments within the photoelectric conversion areas differs from that of another segment.

37. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 36, wherein the area of each segment in the photoelectric conversion areas is inversely proportional to the magnitude of relative spectral sensitivity per unit area of said segment.

38. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein the image sensor is of passive type.

39. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein the image sensor is of active type.

40. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein said MOS image sensor is used for a digital camera.

41. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 1, wherein said array pattern is arranged by offsetting odd lines from even lines by half a pitch.

42. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein said array pattern is arranged in a grid pattern.

43. (CURRENTLY AMENDED) An image pickup device including image capturing means for outputting a plurality of photoelectric conversion signals of different spectral sensitivities using transfer electrodes, wherein said image capturing means includes

a plurality of photoelectric conversion areas provided in an array pattern on a surface of a semiconductor substrate, an inside of each of said photoelectric conversion areas being two-dimensionally partitioned into a plurality of segments which output a plurality of photoelectric conversion signals of different spectral sensitivities, and

light-shielding means, wherein an aperture in said light-shielding means corresponds to at least two of said segments in one of said photoelectric conversion areas, and the diameter or

diagonal dimension of said aperture is smaller than the diameter or diagonal dimension of said one photoelectric conversion area, and is larger than a dimension of at least one segment, and

wherein said plurality of different spectral sensitivities include red, green and blue of primary colors, and the diameter or the diagonal dimension of each said aperture satisfies the formula $\lambda \leq t \leq 2\lambda$ wherein t represents the diameter or the diagonal dimension of said aperture and λ represents the wavelength 0.650 μm of a red color, and

wherein a distance between two of said transfer electrodes is smaller than a distance across segments adjacent to said two transfer electrodes,

the image pickup device further comprising an element isolation zone arranged between the segments in one photoelectric conversion area, wherein the transfer electrodes are formed so as to avoid said element isolation zone and to exist between said photoelectric conversion areas.

44. (CURRENTLY AMENDED) An image pickup device for outputting a plurality of photoelectric conversion signals of different spectral sensitivities comprising:

signal storing means for storing electric charges of different spectral sensitivities in a plurality of segments which are partitioned by dividing an inside of a plurality of photoelectric conversion areas being formed in an array pattern on a surface of a semiconductor substrate, ~~and~~

a light-shielding film wherein an aperture in said light-shielding film corresponds to at least two of said segments in one of said photoelectric conversion areas, wherein said different spectral sensitivities include red, green and blue of primary colors, and the diameter or the diagonal dimension of each said aperture satisfies the formula $\lambda \leq t \leq 2\lambda$ wherein t represents the diameter or the diagonal dimension of said aperture and λ represents the wavelength 0.650 μm of a red color, and

signal transfer means for transferring said electric charges read from a plurality of said segments through channels being formed beside said photoelectric conversion areas, said channels extending along perimeters of said photoelectric conversion areas and substantially parallel to said perimeters,

the image pickup device further comprising an element isolation zone arranged between the segments in one photoelectric conversion area, wherein the channels are formed so as to avoid said element isolation zone and to exist between said photoelectric conversion areas.

45. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 2, wherein the surface of said semiconductor substrate is covered with a light-shielding film having apertures corresponding to said respective photoelectric conversion areas.

46. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 45, wherein the diameter or diagonal dimension of said aperture is larger than the wavelength of incident light and smaller than the diameter or diagonal dimension of said photoelectric conversion area.

47. (PREVIOUSLY PRESENTED) The color solid-state image pickup device according to claim 2, wherein the transfer channel extends, between the photoelectric conversion areas, along the perimeters of the photoelectric conversion areas.

48. (PREVIOUSLY PRESENTED) The MOS image sensor according to claim 19, wherein the transfer channel extends, between the photoelectric conversion areas, along the perimeters of the photoelectric conversion areas.

49. (PREVIOUSLY PRESENTED) The image pickup device according to claim 44, wherein the transfer channel extends, between the photoelectric conversion areas, along the perimeters of the photoelectric conversion areas.